CLAIMS

What is claimed is:

1. A method for classifying an occupant including the steps of:

a) capturing an image of an occupant area;

b) dividing the image into a plurality of subimages of predetermined spatial regions;

c) generating a spatial feature matrix of the image based upon the plurality of subimages;

d) analyzing the spatial feature matrix; and

e) classifying an occupant in the occupant area based upon said step d).

2. The method of claim 1 further including the step of processing the image to account for lighting and motion before said step d).

3. The method of claim 1 further including the step of smoothing the classification of the occupant over time.

4. The method of claim 1 further including the step of determining whether to activate an active restraint based upon the classification of said step e).

5. The method of claim 1 wherein said step d) further includes the step of applying expert classifier algorithm to the spatial feature matrix.

6. The method of claim 5 wherein said step d) further includes the step of analyzing the spatial feature matrix based upon a set of training data.

7. The method of claim 6 further including the step of creating the set of training data by capturing a plurality of images of known occupant classifications of the occupant area.

8. The method of claim 5 wherein the expert classifier algorithm includes a neural network.

9. The method of claim 1 wherein said step d) is based upon system parameters including an orientation or a location from which the image is captured relative to the occupant area in said step a).

10. The method of claim 9 further including the step of:

f) altering the orientation or the location from which the image is captured and adjusting the system parameters.

11. The method of claim 10 wherein said step f) further includes the step of entering physical data representing a physical orientation and location of the occupant area.

12. The method of claim 10 wherein said step f) further includes the step of capturing a calibration image of the occupant area in a known condition and determining the system parameters based upon the calibration image.

13. The method of claim 12 wherein said step f) further includes the step of placing a calibration pattern on the occupant area before the step of capturing the calibration image, such that the calibration image includes the calibration pattern.

14. The method of claim 1 wherein the plurality of subimages overlap one another.

15. A vehicle occupant classification system comprising:

an image sensor for capturing an image of an occupant area; and

a processor dividing the image into a plurality of subimages, the processor analyzing the subimages to determine a classification of the occupant.

16. The vehicle occupant classification system of claim 15 wherein the processor determines the classification of the occupant from among the classifications including: adult, child and infant seat.

17. The vehicle occupant classification system of claim 16 wherein the processor determines the classification of the occupant from among the classifications including: adult, child, forward-facing infant seat and rearward-facing infant seat.

18. The vehicle occupant classification system of claim 15 wherein the processor generates a spatial feature matrix based upon the plurality of subimages.

19. The vehicle occupant classification system of claim 18 further including at least one filter generating the spatial feature matrix based upon the plurality of subimages.

20. The vehicle occupant classification system of claim 19 further including an image processor for altering the image based upon lighting conditions and based upon motion.

21. The vehicle occupant classification system of claim 20 wherein the processor analyzes the spatial feature matrix to determine the occupant classification using a neural network.

22. The vehicle occupant classification system of claim 21 further including a temporal smoothing filter applying a decaying weighting function to a plurality of previous occupant classifications to determine a present occupant classification.

23. The vehicle occupant classification system of claim 22 further including a confidence weighting function applied to the plurality of previous occupant classifications to determine the present occupant classification.

24. The vehicle occupant classification system of claim 15 further including a plurality of digital filters extracting low-level descriptors from each of the subimages, the processor analyzing the low-level descriptors to determine the classification of the occupant.

25. A method for classifying an occupant including the steps of:

a) capturing an image of an occupant area;

b) dividing the image into a plurality of subimages of predetermined spatial regions;

c) generating a plurality of low-level descriptors from each of the plurality of subimages;

d) analyzing the low-level descriptors; and

e) classifying an occupant in the occupant area based upon step d).

26. The method of claim 25 wherein said step d) further includes the step of analyzing the low-level descriptors based upon a set of training data.

27. The method of claim 26 further including the step of creating the set of training data by capturing a plurality of images of known occupant classifications of the occupant area.

28. The method of claim 25 wherein said steps d) and e) are performed using a neural network.

29. The method of claim 25 wherein said step d) is based upon system parameters including an orientation or a location from which the image is captured relative to the occupant area.

30. The method of claim 29 further including the step of:

f) altering the orientation or the location from which the image is captured and adjusting the system parameters.

31. The method of claim 30 wherein said step f) further includes the step of entering physical data representing a physical orientation and location of the occupant area.